SCO® TCP/IP

Derived from

LACHMAN™ SYSTEM V STREAMS TCP

Runtime

Version 1.1.3

Release and Installation Notes

The Santa Cruz Operation, Inc.

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1. Preface

SCO TCP/IP 1.1.3 is an implementation of TCP/IP and related protocols for SCO UNIX System V/386 Release 3.2. The product, although based on the latest functional and performance improvements of 4.3BSD, has been adapted to run within the STREAMS framework and TLI specification of SCO UNIX System V/386 Release 3.2.

Note

This release of SCO TCP/IP is intended for SCO UNIX System V/386 Release 3.2 systems (Release 3.2.1 or later) only and not for SCO XENIX System V.

Please read through this document before installing the SCO TCP/IP software.

The first 6 sections describe product features, configuration requirements, supported hardware, and general steps for installation. Section 7 provides a installation checklist, and section 8 provides help on how to complete it. The installation is much easier if you complete the checklist before installing SCO TCP/IP 1.1.3. Section 9 is the installation procedure, including SCO TCP/IP software installation, driver installation, mail configuration, and overall testing. Section 10 shows how to start and stop SCO TCP/IP, and section 11 shows how to remove SCO TCP/IP. Section 12 describes how to support dial-up SLIP lines. Section 13 lists known problems and possible solutions and section 14 lists documentation errata.

2. Feature Description

SCO TCP/IP 1.1.3 provides the following major features:

TCP	The Transmission Control Protocol (RFC793)
UDP	The User Datagram Protocol (RFC768)
IP	The Internet Protocol (RFC791)
ARP	The Address Resolution Protocol (RFC826)
ICMP	The Internet Control Message Protocol (RFC792)
RIP	The Routing Information Protocol
SLIP	The serial line IP STREAMS module
Loopback	The loopback and test STREAMS module
Utilities	**rsh**, **rlogin**, **rcp**, **telnet** (RFC854), **ftp** (RFC959), **inetd** and other utilities.
NetBIOS	The NetBIOS protocol (RFC1001, 1002)

All features are accessible through TLI. A standard 4.3BSD socket interface is provided with the SCO TCP/IP Development System for application portability.

3. Contents of This Package

The following software and documentation is included in SCO TCP/IP, Release 1.1.3:

- three SCO TCP/IP Runtime diskettes
- these release and installation notes
- *SCO TCP/IP User's Guide*
- *SCO TCP/IP User's Reference*
- *SCO TCP/IP Administrator's Guide*
- *SCO TCP/IP Administrator's Reference*

4. Configuration Requirements

The following chart details the resources needed to run SCO TCP/IP:

COMPUTER	industry standard (AT) 80386 computers, or compatible computers only
OPERATING SYSTEM	SCO UNIX System V/386 Release 3.2.1 or later
SOFTWARE	the operating system mail (MAIL) package and the Link Kit (LINK) package
DISK CAPACITY	at least 3835 Kbytes (3.75 Mbytes) of hard disk storage for SCO TCP/IP Runtime under the UNIX system
RAM	at least 4 Mbytes of RAM for SCO TCP/IP Runtime and SCO UNIX System V/386

5. Supported Hardware

SCO TCP/IP Runtime supports several networking boards, a serial line interface (SLIP), and several Token Ring adapters.

5.1 Supported Networking Cards

SCO TCP/IP Runtime supports the following boards for Ethernet:

- 3Com EtherLink 3C501 card (up to four on one machine)
- 3Com EtherLink II 3C503 card (up to four on one machine)
- Western Digital WD8003E card (up to three on one machine)

Note

The 3Com EtherLink II 3C523 card is not supported with this release. Installation instructions are included with these notes for those who wish to use the card, but it is not supported by our Software Support department.

During installation, the software device drivers for these cards can be configured for various parameters, such as the interrupt vector and base I/O address. These parameters should be chosen with care so as not to conflict with other hardware in your system. Consult the manufacturer's documentation for instructions on setting these options.

Note

On some 386 machines, the system can hang during serial driver initialization if a Western Digital Ethernet card is present.

If this occurs, change the base I/O address in the TCP/IP software and on the Western Digital card. For information on how to change these values, refer to the section "Installing Ethernet, SLIP, and Token Ring Drivers" later in these notes.

5.2 Serial Line Support

The SLIP protocol driver provided with SCO TCP/IP Runtime uses the regular SCO tty device interface and works with any serial card supported by the SCO SIO driver. The release notes for your operating system contain a list of serial I/O boards supported by the SIO driver.

5.3 Supported Token Ring Adapters

The following Token Ring adapters are supported:

- IBM Token Ring Adapter
- IBM Token Ring Adapter II (long card), 4 MHz, for the AT
- IBM Token Ring Adapter II (short card), 4 MHz, for the AT
- IBM Token Ring Adapter, 4/16 MHz, for the AT
- IBM Token Ring Adapter/A, 4 MHz, for the PS/2
- IBM Token Ring Adapter/A, 4/16 MHz, for the PS/2

Be careful to avoid overlapping addresses for the various cards, drivers, and adapters in the system. Be aware of potential conflicts before setting jumpers on the cards.

6. Installation and Configuration Overview

The following procedure is a general overview of installing and configuring SCO TCP/IP Runtime. It refers you to subsequent sections of these notes for more information.

1. Fill out the installation checklist found in the next section of these notes. Information on how to fill out the checklist can be obtained from the section "Installation Background" later in these notes.
2. After you fill out the checklist, log in as *root* and bring the system to single user mode.
3. Be certain that you are in the root (/) directory before you start the installation procedure.
4. Install TCP/IP software using the **custom** utility.
5. Install the drivers for the Ethernet boards, SLIP connections, or Token Ring adapters.
6. Configure network interfaces.
7. Adjust the MMDF or **sendmail** configuration files for your installation.
8. Test TCP/IP.
9. Tune default configurations, if needed.

7. Installation Checklist

If you complete this checklist before you install SCO TCP/IP, you will find that the installation process flows more smoothly than if you attempt to answer prompts as you install. The next section of these notes, "Installation Background," provides you with most of the information you need to fill out the checklist.

Installation Checklist

Serialization Number: _____

Activation Key: _____

System Name: UTBRS'

Network Driver Prompts

Driver Type: e3B

Interrupt Vector: 2

I/O Base Address: ~~300~~ 350

If you are installing a 3Com 3C503 driver:

Ethernet Cable: ☐ Thick (DIX) ☒ Thin

If you are installing a Western Digital WD8003E driver:

RAM Buffer Size: _____

RAM Buffer Base Address: _____

Domain Name: CIV.UTWENTE.NL

IP Address: 130.89.1.219

Broadcast Address Parameters: ☐ all zeroes 130.89.255.255 ☐ all ones

netmask Setting: 255.255.0.0

If you are using SCO TCP/IP over a SLIP Line:	
tty Line:	☐ **tty1A** ☐ **tty2A**
Source IP Address:	_____
Destination IP Address:	_____
Baud Rate:	_____
SLIP netmask:	_____

8. Installation Background

Before you install SCO TCP/IP Runtime, you should know how to answer each of the configuration prompts that appear on the screen during the installation. This section provides information on software and hardware prompts you need to answer as you install SCO TCP/IP Runtime. Use the information found in this section to fill in the checklist located in the previous section. Installation prompts include:

- the system's host name and domain name
- the Internet address(es) for each driver, adapter, or SLIP line
- the broadcast address option for your network
- the netmask for your network
- hardware interrupt vectors, base memory addresses, and RAM buffer sizes

8.1 System Name

Your system name, or host name, should be unique on your network. It can consist of lowercase letters and numbers, must begin with a letter, and should be no longer than eight characters. This system name is used by **mail** and other programs to identify the correct data destination. Here are some sample valid machine names: *scosysv*, *tcpdev*, *account1*.

8.2 Driver Type

The driver is the software that allows your networking cards or hardware to interact with SCO TCP/IP. Each card, adapter, or SLIP line that you use must be uniquely associated with a particular device driver. You can install up to four Ethernet cards and up to two Token Ring adapters or serial line interfaces, but you can only configure one driver at a time. When you are prompted for the driver type, choose the type you want to configure. The driver choices and their related hardware are shown in the following table:

Driver and Network Hardware Equivalences

Driver	Networking Hardware
e3A	3Com 3C501
e3B	3Com 3C503
e3C	3Com 3C523
wdn	WESTERN DIGITAL WD8003
slip	Serial Connection
token	Token Ring Adapter

Interrupt Vector

Each driver on your system, including those for network cards and SLIP lines, must have its own interrupt vector. This vector must not conflict with (be the same as) others on the system. A networking card commonly uses interrupt vectors 2 or 5. A SLIP line commonly uses vectors 3 or 4. Refer to your networking hardware documentation to determine what vectors the hardware supports. In addition, the **hwconfig** and **vectorsinuse** programs list the hardware already installed on your system and what vectors are already in use, respectively. Your networking hardware might be pre-configured to use a particular vector. If you want to change this vector setting, you might also need to change the physical jumper settings on the board.

I/O Base Address

Each hardware driver on your system that performs I/O (input/output) needs a unique memory base address so that the system can locate it. This memory address is a three-digit hexadecimal number, must match the settings on the board, and must not conflict with the other hardware on your system. Valid addresses fall within the range of 200 and 3e0.

Thick/Thin Cable

This prompt is specific to the 3Com 503 driver only. It asks you to specify whether the board connects to thick or thin Ethernet cable.

- Thin cable provides a direct connection to the network without the use of a transceiver. Most installations use thin cable. If you have thin cable, type **n** at the thick/thin prompt.

- Thick cable connects your 3Com 503 board to a transceiver, which in turn connects to the Ethernet cable. If you use thick cable, type **y** at the thick/thin prompt.

RAM Buffer Size and Base Address

These prompts are specific to the Western Digital 8003E card and its associated driver, *wdn*. This board requires a designated space in RAM to do buffering; you need to enter this address (as a five-digit hexadecimal number) and the buffer size. The default settings for this board are 8 for the buffer size and d0000 for the RAM base address. If you want to change these settings and have a WD8003EB card, you must run the Western Digital setup program provided with your hardware after installing SCO TCP/IP. Refer to your Western Digital documentation for more information on using non-default parameters.

8.3 Domain Name

The BIND (Berkeley Internet Name Domain) name server and MMDF use the domain name to route messages, such as mail, from machine to machine. The domain name allows your network to fit into a hierarchical network structure composed of commercial organizations (.COM), educational institutions (.EDU), the government (.GOV), the military (.MIL) or miscellaneous organizations (.ORG). Sample domain names are *sco.COM* (the domain name used by SCO) and *berkeley.EDU* (the domain name used by the University of California at Berkeley).

Base your domain name choice on the following:

- If other machines on your network already use a domain name, use the same name for the machine you are installing.

- If you are creating a new domain and want to use BIND to connect to the outside world, you need to register the name with the appropriate network (DARPA Internet, CSNET, or BITNET). To register a domain name, write to:

 DDN Network Information Center
 SRI International
 333 Ravenswood Avenue, Room EJ291
 Menlo Park, CA 94025 USA

- If you are creating a new domain and might or might not eventually connect to an outside network, use the name *name*.UUCP, where name is the name of your company or organization.

8.4 IP Address

The IP address identifies and differentiates your machine from all others on the network. It consists of a 32-bit binary number that is usually displayed as 4 octets expressed in decimal and separated by periods. You must have a unique IP address for each machine on your network. In addition, if your machine serves as a *gateway* to another network, it will contain two or more network cards and belong to two or more networks. In this case, you must assign each card a unique IP address on the appropriate network.

The IP address consists of two parts: a network address that identifies the network and a host address that identifies the particular host, or node. The following table shows an IP address in binary form, as binary octets, as decimal octets, and as it appears in standard notation.

IP Address Derivation

binary (32-bit)	10000100100011110000001000000010			
binary (octets)	10000100	10001111	00000010	00000010
decimal octets	132	147	2	2

IP address (in standard notation) = 132.147.2.2

Several classes of TCP/IP networks are available, each based on the number of hosts a network needs. Network classes supported by SCO are Class A, B, and C. Use the smallest network class that can accommodate all of your network's hosts. Most SCO TCP/IP installations use Class C, but some larger installations might need to use Class B.

The following table lists valid network addresses for each class:

Internet Address Classes

Class	Available Hosts per Network	Valid Address Ranges
A	16777216	1.0.0.1 through 126.255.255.254
B	65534	128.0.0.1 through 191.255.255.254
C	254	192.0.0.1 through 222.255.255.254
Reserved		224.0.0.0 through 255.255.255.254

If you are connecting your machine to a pre-existing network, the network address (for Class A, the first octet; for Class B, the first two octets; and for Class C; the first three octets) is the same as those of other machines on the network. In this case, you need only concern yourself with creating a unique host address.

If you are creating an entirely new network and you want to connect to the DARPA Internet, you need to contact the Network Information Center located at SRI International in Menlo Park, California, to have a network address assigned. The full address is in section 8.3. If you do not want to connect to an outside network, you can choose any network address as long as it conforms to the syntax shown previously. In either case, once you determine the network address, you can then create the unique host address.

When you determine the IP address, keep in mind the following:

- Each logical network must have its own network address.
- All hosts in a network must have the same network address.
- All hosts in a network must have unique host addresses.
- Do not use the following network addresses: 0 or 127 (Class A), 191.255 (Class B), 223.255.255 (Class C), or any of the addresses shown in the Reserved class of the previous table.

8.5 Broadcast Address Parameters

All datagrams sent by SCO TCP/IP move through all machines on the network path. However, each host adapter ignores any packet that does not include that particular computer's IP address in the datagram header. Occasionally, you might want to send a message to all machines on a particular network. To do so, select a *broadcast address* for your machine. The installation procedure prompts you to choose between the following address schemes:

Broadcast Address Schemes

Scheme	Example	Purpose
all zeroes (decimal 0)	132.147.0.0	provides compatibility with 4.2BSD systems
all ones (decimal 255)	132.147.255.255	UNIX Operating System Standard (RFC-919)

If you are on a network that contains any machines running 4.2BSD UNIX or earlier BSD versions, choose all zeroes. If no such machines exist on your network, choose all ones. After you make this choice, you are prompted to confirm the broadcast address that is shown on the screen.

8.6 netmask Setting

The netmask strips the network ID from the IP address, leaving only the host ID. Each netmask consists of binary ones (decimal 255) to mask or binary zeroes (decimal 0) to retain octets of the IP address. For example, the default netmask setting for a Class B address is 255.255.0.0. Always use the default address that the installation program prompts you for unless you are creating a subnet, a logical division of a physical network. If you create a subnet, also mask the portion of the address that indicates the subnet. Class C networks do not support subnets. For more information on creating subnets, refer to Chapter 1, "Network Administration," of the *SCO TCP/IP Runtime Administrator's Guide*.

8.7 SCO TCP/IP over a SLIP Line

If you are using SCO TCP/IP over a SLIP line, you need to answer several additional prompts.

tty Line

This line indicates what *tty* the SLIP line connects to.

- If you are connecting to COM1:, interrupt vector 4, enter **tty1A**.
- If you are connecting to COM2:, interrupt vector 3, enter **tty2A**.

Source IP Address

Enter the IP address for this host (this end of the SLIP line). For more information on determining IP addresses, see the previous section in these notes.

Destination IP Address

Enter the IP address for the remote host (the opposite end of the SLIP line).

Baud Rate

Enter the baud rate at which data is transmitted. The default is 9600. Some networking hardware can only handle up to 2400 or 1200 baud. Refer to your hardware documentation for more information.

SLIP netmask

Choose a netmask for this SLIP line. For more information on netmasks, see the section "netmask Setting" earlier in these notes.

9. Installing TCP/IP Runtime

Under the UNIX system, installation is done through the **custom** utility. Follow the steps outlined below to install SCO TCP/IP Runtime. Note that the Link Kit must be installed before SCO TCP/IP can be installed. The MAIL package of the operating system must be installed if you wish to use **sendmail** as provided with SCO TCP/IP.

Note

If you are installing both SCO TCP/IP and an SCO LLI drivers update package at this time, you must install SCO TCP/IP first.

Several files are replaced during TCP/IP installation. The original versions of these files are saved in */usr/lib/custom/save*. When TCP/IP is removed, these files are restored. The files include */etc/networks*, */usr/mmdf/mmdftailor*, */etc/hosts*, and */etc/hosts.equiv*.

To install TCP/IP, follow these steps:

1. Bring the system to system maintenance mode.

 One way to do this is to type **sync** and press ⟨Return⟩. Then type **init 6** and press ⟨Return⟩. At the `Boot:` prompt, press ⟨Return⟩. After the operating system is loaded, the following message appears:

   ```
   Type CONTROL-d to proceed with normal startup,
   (or give root password for system maintenance).
   ```

 Give the root password and press ⟨Return⟩.

2. Type **custom** and press ⟨Return⟩.

3. The initial **custom** menu appears. Select Install.

4. The following message prompts you for the product name: `Select a Product`. Choose A New Product and press ⟨Return⟩.

5. The Install menu appears. Select Entire Product to install all of the packages, or select Packages to install a subset of the product. Unless you are updating individual packages or have space constraints on your hard disk, select Entire Product.

6. You are prompted to insert distribution volume 1. Insert the floppy into drive 0 and press ⟨Return⟩ to continue. The following messages appear:

```
Installing Custom Data Files...
Creating file lists...
```

7. If you selected Packages, a display of package names appears. The selection TCPRT installs SCO TCP/IP Runtime; SNDMAIL installs **sendmail** runtime; MMDFTCP is the network SMTP interface for use with the MMDF system; NETBIOS is the NetBIOS driver needed for products such as SCO LM/X; TCPMAN installs the online manual pages; and ALL installs all the files. Select the desired packages, and press ⟨Return⟩.

 If you select ALL, MMDF becomes the active mailer. The active mailer is not **sendmail** unless explicitly configured, as shown in the section "Adjusting sendmail Configuration" later in these notes.

8. You are prompted to insert TCP/IP volume 1. Because it is already in the floppy disk drive, simply press ⟨Return⟩ to continue. The following message appears:

```
Extracting files...
```

 It takes several minutes for the files to be extracted from volume 1. (If you are installing only the option SNDMAIL or MMDFTCP, you then see the message `Checking file permissions`, followed by a return to the Install menu.)

9. You are prompted to insert volume 2. Insert the volume and press ⟨Return⟩ to continue. The file extraction message reappears.

10. You are prompted to insert volume 3. Insert the volume and press ⟨Return⟩. The file extraction message reappears.

11. If you are installing TCPRT, the following message prompts you for your serial number:

```
Enter your serial number or enter q to quit:
```

Enter the serial number as it appears on your SCO TCP/IP serial number and activation key card and press ⟨Return⟩.

12. The following message prompts you for your activation key:

```
Enter your activation key or enter q to quit:
```

Enter the activation key as it appears on your SCO TCP/IP serial number and activation key card and press ⟨Return⟩.

Volume 3 can be removed at this point.

13. If you installed the NETBIOS package, you see the following message:

```
NETBIOS installation complete.
```

14. A message lists several files that are saved at this point. (The */etc/hosts* and */etc/hosts.equiv* files are saved in */usr/lib/tcprt/save*.)

15. The following messages appear:

```
Streams modules have been successfully
added to the kernel.
Changing streams resources for TCP/IP...

Updating system configuration...
```

This process can take several minutes. After this pause, the following messages appear:

```
Installing SCO TCP/IP Runtime System...

The current system node name is x
Do you wish to change it? (y/n/q)
```

x is the current system name. To change it, type **y**. Your system name should be unique to your network.

If you type **y**, you see the following message:

```
Enter new system node name:
```

Enter the new name, and press ⟨Return⟩.

16. You are asked if you wish to relink the kernel. To save time, do not relink the kernel until you have added all of the drivers (network cards, adapters, etc.) you want to use to your system.

 If you type **n**, you see the message:

```
SCO TCP Runtime will not work
until the kernel is relinked.
```

 Press ⟨Return⟩. and the message `Checking file permissions...` appears, followed by a short pause.

 If you type **y**, the following messages appear:

```
The UNIX Operating System will now be rebuilt.
This will take a few minutes, please wait.
Root for the system build is /.
Re-linking the kernel...
```

After a pause, this is followed by:

```
The UNIX kernel has been rebuilt.
Do you want this kernel to boot by default?
```

If you type **y**, your old kernel is copied to */unix.old*, and your new kernel is copied to */unix*.

17. If you relinked your kernel, you see the messages:

```
The kernel environment includes device node files
and /etc/inittab.  The new kernel can require
changes to /etc/inittab or device nodes.
Do you want the kernel environment rebuilt (y/n)?
```

If you type **n** you see the message:

```
Device node or inittab changes associated with this
new kernel have not been made. These changes should
be made by running: touch /etc/.new_unix;
/etc/conf/bin/idmkenv.
```

If you type y you see the messages:

```
The kernel has been successfully linked and installed.
To activate it, reboot your system.

Setting up new kernel environment...

The new kernel is installed in /unix.
Reboot your system to activate it.
```

18. Next you are returned to the **custom** Install menu. Select quit and press ⟨Return⟩. Select yes and press ⟨Return⟩ to exit.

19. If networking hardware was not previously installed on your system, install the appropriate driver(s) by running the appropriate **mkdev** command. These commands are described in the next section, "Installing Ethernet, SLIP, and Token Ring Drivers."

20. Configure SCO TCP/IP Runtime by running the **mkdev tcp** program. This program is described in the section "Configuring Network Interfaces" later in these notes.

9.1 Administering Pseudo ttys

During the installation procedure, pseudo ttys ttyp00 through ttyp07 are added automatically. These ttys allow outside machines to use **telnet** or **rlogin** to access TCP/IP on your machine. If you do not want these pseudo ttys added, use **sysadmsh**(ADM) to remove them.

You can increase the number of pseudo ttys. SCO TCP/IP refers to pseudo tty devices as tty*XX* where *XX* is a hexadecimal number. The following steps show how to increase the number of pseudo ttys:

1. Log in to the system as *root*.

2. Enter the following commands:

 cd /etc/conf/bin
 ./idtune NTTYP 20
 cd /etc/conf/node.d

 This example shows how to increase the number of pseudo ttys to 20. Adjust **NTTYP** according to the number of pseudo ttys you want.

3. Use an editor to add the following lines to *ttyp*:

```
ttyp    ttyp08    c    8
ttyp    ttyp09    c    9
ttyp    ttyp0a    c    10
ttyp    ttyp0b    c    11
ttyp    ttyp0c    c    12
ttyp    ttyp0d    c    13
ttyp    ttyp0e    c    14
ttyp    ttyp0f    c    15
ttyp    ttyp10    c    16
ttyp    ttyp11    c    17
ttyp    ttyp12    c    18
ttyp    ttyp13    c    19
```

4. Use an editor to add the following lines to *vty*:

```
vtp     ptyp08   c   8
vtp     ptyp09   c   9
vtp     ptyp0a   c   10
vtp     ptyp0b   c   11
vtp     ptyp0c   c   12
vtp     ptyp0d   c   13
vtp     ptyp0e   c   14
vtp     ptyp0f   c   15
vtp     ptyp10   c   16
vtp     ptyp11   c   17
vtp     ptyp12   c   18
vtp     ptyp13   c   19
```

5. Enter the following commands:

```
tcp stop
cd /etc/conf/cf.d
./link_unix
```

6. The **link_unix** program responds with the following message and prompt:

```
The UNIX Operating System will now be rebuilt.
This will take a few minutes.  Please wait.

Root for this system build is /.

Do you want this kernel to boot by default? (y/n)
```

Answer **y**.

7. The **link_unix** program responds with the following message and prompt:

```
Backing up /unix to /unix.old
Installing new /unix

Do you want the kernel environment rebuilt? (y/n)
```

Answer **y**. The **link_unix** program displays a message confirming that the kernel is linked and installed.

8. Log in as *root* to add the new pseudo ttys to the database. Enter the following:

sysadmsh

9. Once in **sysadmsh** select Accounts, Terminal, Create, and add ttyp08, ttyp09, ttyp0a, ttyp0b, ttyp0c, ttyp0d, ttyp0e, ttyp0f, ttyp10, ttyp11, ttyp12, and ttyp13 to the terminal database.

If you neglect to add the new pseudo ttys to the database, when someone attempts to log in, they get the following error:

```
Cannot obtain database information on this terminal.
Connection closed.
```

10. Press ⟨F2⟩ (function key 2) and select Yes to quit **sysadmsh**.

11. Reboot the machine using the following command:

 sync;sync;shutdown

12. Test all new pseudo ttys by trying to log in to them. If there are any failures, verify your procedure, especially steps 3 and 4. If you made a mistake editing these files, you can recover easily by entering the following commands as *root*:

 touch /etc/.new_unix
 /etc/conf/bin/idmkenv

 Errors in the tty database can be corrected through **sysadmsh**.

9.2 Installing Ethernet, SLIP, and Token Ring Drivers

Be sure to familiarize yourself with the other cards and drivers in the system before installing additional drivers. Otherwise, overlaps can occur. The current list of devices is shown on the console when the system boots. This information is also available in the file */usr/adm/hwconfig*. For more information on installing cards and drivers, see your operating system's *System Administrator's Guide*.

To install network drivers, you first run the **mkdev** *interface* command, using the appropriate interface name for each network card you want to add. Then, run the **mkdev tcp** command to configure your network interfaces. The following sections explain these procedures in detail.

Note

If you are installing drivers from an SCO LLI drivers update package, use the **mkdev** configuration procedures described in the following sections rather than the **netconfig** procedure described in the LLI *Release and Installation Notes*. *The* **netconfig** command cannot be used to install network drivers with this release of SCO TCP/IP.

You might need to install multiple drivers. For example, if your machine serves as a gateway to two or more networks, each piece of networking hardware needs its own driver. You can install these drivers in any order you choose.

9.2.1 Western Digital WD8003E

1. To install a driver for one of the Western Digital WD8003E family of ethernet adapters, type **mkdev wdn** at the command-line prompt (#).

   ```
   Do you wish to install or delete the wdn
   driver? (i/d/q)
   ```

 Enter **i** to install the driver.

2. A screen describing the Western Digital setup is displayed. This screen describes the default configuration for your Western Digital board, and we recommend you read it closely.

 Enter **y** to continue installing the driver.

3. A screen displays defaults similar to these:

```
Interrupt Request Channel (IRQ)     3
I/O Base Address                  240 (hex)
RAM Buffer Size (in Kbytes)         8
RAM Buffer Base Address         d0000 (hex)
```

Unless you have different values that you wish to use, type **n.**

4. The following message is displayed:

```
Do you have another Western Digital 8003E
board? (y/n/q)
```

To install another board, enter **y** and repeat the procedure. If not, enter **n.**

5. You are then asked if you wish to relink the kernel. To save time, do not relink the kernel until you have added all of the drivers (network cards, adapters, etc.) you want to use to your system.

If you type **y** to relink the kernel, a message affirms that choice. Then, this message is displayed:

```
Do you want this kernel to boot by default? (y/n)
```

Enter **y**. You see several messages, including:

```
Do you want the kernel environment rebuilt? (y/n)
```

Enter **y**. This procedure takes a few minutes.

If you relinked the kernel, you can reboot from the new kernel at this point to verify that the drivers are configured in the kernel and that the software and hardware addresses match. However, you cannot verify that interrupt vectors and memory addresses are set up correctly until you test the network as shown later in these notes.

Note

On some 386 machines, the system can hang during serial driver initialization if a WD8003E card is present. This generally occurs due to I/O address or interrupt vector conflicts. You might need to delete and reinstall the wdn driver with new values. The following values have been tested by the SCO Support department:

- base I/O addresses of 280 and 380
- interrupt vector 2

To delete the wdn driver, type **mkdev wdn** and select the delete option from the install/delete/quit prompt. To reinstall the wdn driver, follow the procedure shown previously.

9.2.2 3Com EtherLink 3C501 or 3C503

The procedures for installing the 3Com EtherLink 3C501 card driver and the 3Com EtherLink II 3C503 card driver are very similar.

Note

The 3Com EtherLink II 3C523 card is not supported with this release. Installation instructions are included here for those who wish to use the card, but it is not supported by our Support department.

- To install the 3Com EtherLink 3C501 card driver, use the **mkdev e3A** command.
- To install the 3Com EtherLink II 3C503 card driver, use the **mkdev e3B** command.
- To install the 3Com EtherLink II 3C523 card driver, use the **mkdev e3C** command.

1. Type the appropriate **mkdev** command at the command line and press ⟨Return⟩.
2. You see the following prompt, where *type* is the driver that you are installing:

```
Do you wish to install or delete the type
driver? (i/d/q)
```

Enter **i** to install the driver.

3. A screen describing the 3Com EtherLink setup is displayed. This screen describes your card's default configuration values, and we recommend you read it closely.

 Enter y when you are ready to continue.

4. You see the message:

```
Boardn: Interrupt vector number (2-7) [2]:
```

 The numbers in parentheses are the valid vector numbers, while the number in square brackets is the default. Press ⟨Return⟩ to select the default value, or type in the desired number and press ⟨Return⟩.

5. You are then similarly prompted for the I/O base address:

```
Boardn: IO base address (in hexadecimal
000-3f0) [300]:
```

 Press ⟨Return⟩ to select the default value, or enter your own address and press ⟨Return⟩.

6. If you are installing the 3C503 or 3C523 drivers, you see this additional prompt:

```
Boardn: Does this type board use thick (DIX)
ethernet? (y/n)
```

Enter **y** or **n**.

7. This message is displayed:

```
Do you have another type board? (y/n)
```

To install another board, enter **y** and repeat the procedure. If not, enter **n**.

8. Finally, you are asked if you wish to relink the kernel. To save time, do not relink the kernel until you have added all of the drivers (network cards, adapters, etc.) you want to use to your system.

 If you type **y** to relink the kernel, a message affirms that choice. Then, this message is displayed:

```
Do you want this kernel to boot by default? (y/n)
```

Enter **y**. You see several messages, including:

```
Do you want the kernel environment rebuilt? (y/n)
```

Enter **y**. This procedure takes a few minutes.

If you relinked the kernel, you can reboot from the new kernel at this point to verify that the drivers are configured in the kernel and that the software and hardware addresses match. However, you cannot verify that interrupt vectors and memory addresses are set up correctly until you test the network as shown later in these notes.

9.2.3 SLIP Connection

To install the slip driver:

1. Type **mkdev slip** at the command line and press ⟨Return⟩.
2. You see:

```
Do you wish to install or delete the slip
driver? (i/d/q)
```

Enter **i** to install the driver.

The following message is displayed:

```
Installing slip driver ...
```

3. You are prompted to relink the kernel. To save time, do not relink the kernel until you have added all of the drivers (network cards, adapters, etc.) you want to use to your system.

 If you type y to relink the kernel, a message affirms that choice. Then, this message is displayed:

```
Do you want this kernel to boot by default? (y/n)
```

 Enter y. You see several messages, including:

```
Do you want the kernel environment rebuilt? (y/n)
```

 Enter y. This procedure takes a few minutes.

If you relinked the kernel, you can reboot from the new kernel at this point to verify that the drivers are configured in the kernel and that the software and hardware addresses match. However, you cannot verify that interrupt vectors and memory addresses are set up correctly until you test the network as shown in later sections.

9.2.4 Token Ring Adapter

Token Ring can be installed using either one or two adapter cards. If you are using two cards, ensure that you have set up one card as the primary adapter, and the other as the alternate adapter. Do this using the Primary-Alternate switches on the cards. Obtain switch information for each of your cards from their hardware documentation.

If your adapter is not an IBM Token Ring Adapter, you are *strongly* advised to set the size of the shared RAM on the adapter to 16 Kbytes.

To install Token Ring, follow the instructions below:

1. At the operating system prompt (#), type the command:

 mkdev token

 Then press ⟨Return⟩.

2. The following prompt is displayed:

```
Do you want to install or remove the Token Ring driver
or modify routing? (i/r/m/q)
```

 Type **i** to install the driver into the kernel.

3. A screen describing the Token Ring setup is displayed. This screen describes default Token Ring configuration values, and we recommend you read it closely.

4. The following prompt is displayed:

```
Do you want to continue? (y/n/q)
```

 Type **y** to continue the installation.

5. The following message is displayed:

```
Please enter the Interrupt Vector (2,3,6 or 7) [2]:
```

The numbers in parentheses are the valid interrupt vectors. The number in square brackets is the default value.

Press ⟨Return⟩ to select the default value or type in a different value and press ⟨Return⟩.

Note

We recommend that you install your primary adapter card using interrupt vector 2. This is the factory default. If you are installing an alternate adapter, use interrupt vector 3.

If you use interrupt vector 3, you must disable the alternative serial port. Do this by editing the */etc/conf/sdevice.d/sio* file after completing the installation. Change the "Y" found in the second field on the second line to "N" as follows:

```
sio   Y   1   7   1   4   3f8   3ff   0   0
sio   Y   1   7   1   3   2f8   2ff   0   0
```

to:

```
sio   Y   1   7   1   4   3f8   3ff   0   0
sio   N   1   7   1   3   2f8   2ff   0   0
```

Interrupt vectors 6 and 7 (IRQ6 and IRQ7) can also be used to install Token Ring adapter cards. If you want to use either of these interrupt vectors to install a Token Ring adapter, check your system configuration. Find out whether any other device is currently using either of these vector numbers. You must disable the device that uses the vector number before installing the Token Ring adapter. Do this by editing the associated file under */etc/conf/sdevice.d*.

6. The following prompt is displayed:

```
Do you want Token Ring routing? (y/n/q)
```

Token Ring allows you to establish connections from your machine to other machines in either of the following ways:

- on the local ring
- on another ring using a bridge

Token Ring can run on a single ring network. Alternatively, several rings can be connected together, using bridges or gateways. When a bridge is used, the rings appear as a single LAN.

If you need to make connections between different rings, you must enable Token Ring routing. Without Token Ring routing, you can only establish connections on the local ring from your machine. Note, however, that if a bridge exists on the local ring, a non-local machine with routing can establish a connection with your machine. Token Ring routing makes use of the Routing Information Field, which is part of the Token Ring frame and not the TCP/IP route.

You must use Token Ring routing if you are connecting two or more rings using bridges. To select Token Ring routing, enter **y** at the prompt shown earlier. If you decide not to use Token Ring routing, enter **n** at the prompt.

A routing inhibitor file is created to suppress Token Ring routing. (The file */usr/lib/token/noroute0* is created to suppress Token Ring routing for the primary adapter. The file */usr/lib/token/noroute1* is created to suppress Token Ring routing for the alternate adapter.)

7. The following prompt is displayed:

```
Do you have another board? (y/n/q)
```

If you wish to connect two or more networks using a gateway, you must install both primary and alternate adapters on the gateway machine.

If you have not installed an alternate adapter, answer **n** at the prompt. If you have installed an alternate adapter, answer **y**. Repeat steps 4 and 5 to set up the interrupt vector and routing support for the alternate adapter.

8. The kernel must be relinked and the operating system rebuilt to install Token Ring.

 The following prompt is displayed:

```
Do you wish to relink the kernel now? (y/n/q)
```

To save time, do not relink the kernel until you have added to your system all of the drivers (network cards, adapters, etc.) you want to use.

If you answer **y** to relink the kernel, several messages are displayed as the operating system is rebuilt.

Answer **n** if you do not wish to relink the kernel. Note, however, that the kernel must be relinked before the driver can be used.

9. If you relink the kernel, the following message is displayed:

```
To complete installation run mkdev tcp
and reboot the system using init 6
```

To use Token Ring with SCO TCP/IP, you must configure the Token Ring driver. Run **mkdev tcp** and select the token option. The **mkdev tcp** procedure is described later in these notes.

If you are installing both primary and alternate adapters, both adapters must be configured from the same invocation of **mkdev tcp**. Select the token option twice. The first selection of token configures the primary adapter. The second selection of token configures the alternate adapter.

10. Reboot the system to bring the driver configuration changes into effect. The driver is now ready for use.

9.3 Removing and Reinstalling a Driver

If you need to reinstall a driver, change driver settings, or install another driver of the same type, you must first remove all drivers of that type by running the appropriate **mkdev** script and selecting **d** (delete) instead of **i** (install). (Selecting **d** once removes all drivers of the same type.) When you delete or reinstall one or more drivers, keep in mind the following:

- If you have installed multiple cards of the same type, you must remove all of the drivers of that type to reinstall, modify, or newly install any one of them.

- You must always avoid I/O address and interrupt vector conflicts. The **hwconfig** and **vectorsinuse** programs display information about the hardware currently installed on the system.

- We suggest that you fill out the installation checklist found previously in this guide for each driver that you reinstall. This will save you time during the installation procedure.

- You must relink the kernel before your driver changes will take effect. Each relinking of the kernel takes several minutes and requires that you reboot the system. Therefore, if you are performing multiple deletions or reinstallations, you should wait to relink the kernel until after you have made your final change. You can relink the kernel from the command line by using the **link_unix** command found in the directory */etc/conf/cf.d*.

9.4 Configuring Network Interfaces

After you install each of your networking drivers, you are ready to configure SCO TCP/IP by using the **mkdev tcp** program. This section describes the procedure. You must configure all drivers of a given type at one iteration of **mkdev tcp**; otherwise, duplicate lines are created in the files */etc/strcf* and */etc/tcp*.

1. At the command-line prompt (#), type **mkdev tcp** and press ⟨Return⟩. You see the following prompt:

```
Which driver(s) will TCP/IP be using?

Please choose one of the following:

        e3A
        e3B
        e3C
        wdn
        slip
        token

Enter the name of the driver TCP/IP will
use or enter q to quit:
```

Enter the name and press ⟨Return⟩. If you enter **q** at this time, the network interface configuration procedure is aborted. If you are unsure which driver corresponds to your networking hardware, refer to the driver/networking hardware equivalence table in the section "Installation Background" earlier in these notes.

2. The following prompt is displayed:

```
Enter DOMAIN name for type [sco.COM]
```

Note that *type* is the interface name, and the name in the square brackets is an example of the format that you should use to enter the domain name. If the domain name is correct for your machine, simply press ⟨Return⟩. Otherwise, enter the correct domain name and press ⟨Return⟩.

This message occurs only for the first driver chosen.

3. The following message appears:

```
Interface type[n] IP address [132.147.160.1]:
```

Note that *type* is the interface name that you specified in the previous step, and the number in the square brackets is an example of the format that you should use to enter the IP address (four decimal numbers separated by periods).

Enter the IP address for the card and press ⟨Return⟩.

4. You then see the following prompt:

```
Does Interface type[n] use a broadcast address
of all 0's? [y/n]
```

If your interface type uses a broadcast address of all 0's, enter **y**; if it uses all 1's, enter **n**. Then, press ⟨Return⟩. Make sure this broadcast address is the same for all machines on a network. For more information, see the section on broadcast address parameters earlier in these notes.

5. The following message appears:

```
Interface type[n] broadcast address [132.147.255.255]:
```

The broadcast address varies depending on the IP address that you specified previously. If this address is correct, press ⟨Return⟩. Otherwise, enter the correct broadcast address and press ⟨Return⟩.

6. Next, you see this message:

```
Interface type[n] netmask [255.255.0.0]:
```

If the netmask is correct, press ⟨Return⟩. Otherwise, enter a different number for the netmask, and press ⟨Return⟩.

If you select slip to be the driver that SCO TCP/IP uses, you are prompted to supply information related to SLIP lines. Steps 7 through 11 relate to SLIP lines.

7. First, you are prompted to enter the tty line:

```
tty line:
```

Enter a tty line (for example, **tty2A**) and press ⟨Return⟩.

8. You are then prompted for the source IP address:

```
Interface source (you) IP address:
```

Enter a number in the form of four decimal numbers separated by periods (for example, **132.147.160.1**) and press ⟨Return⟩.

9. You are then prompted for the destination IP address:

```
Interface destination (them) IP address:
```

Enter a number and press ⟨Return⟩.

10. Next, you see:

```
Baud rate (default 9600):
```

If 9600 is the correct baud rate, press ⟨Return⟩. Otherwise, enter the new baud rate and press ⟨Return⟩.

11. You are prompted for the netmask:

```
SLIP Interface on ttynn netmask [255.255.0.0];
```

Note that tty*nn* refers to the tty line that the slip driver is using. If the netmask is correct, press ⟨Return⟩. Otherwise, enter the correct netmask number, following the format of the example, and press ⟨Return⟩.

After you enter all the necessary information, you see:

```
Configuring TCP/IP for type.  Please Wait.
```

12. You then return to the SCO TCP/IP Ethernet Driver Configuration menu. If you have multiple drivers of a given type, select that type again and enter the required information for that driver at each of the prompts. When all drivers are configured, enter **q** to quit.

 This process can take several minutes. When complete, the following message is displayed:

```
TCP/IP Driver Configuration Completed.
```

See Chapter 1 of the *SCO TCP/IP Administrator's Guide* for more information. The most helpful sections are "Setting Interface Parameters," "Local Subnetworks," and "Internet Broadcast Addresses."

9.5 Routing mail over TCP/IP

Routing **mail** over TCP/IP under the UNIX system requires a simple addition to the MMDF routing system. All that is necessary is to edit the */usr/mmdf* files and then recompile using **dbmbuild**(ADM). The following discussion assumes we are adding an MMDF SMTP channel for the domain *sco.COM*. The host name is *medusa.sco.COM*.

1. Log in as the user *mmdf*.

2. Edit the file */usr/mmdf/mmdftailor* to make the following changes:

 - Change MLDOMAIN as appropriate to reflect your domain. For example, enter:

 MLDOMAIN sco.COM

 - Add references as needed to domain files (but not to top-level domains such as COM, EDU, GOV, and so on; these are in *root.dom*). For example, enter:

 MTBL smtpdom, file="smtp.dom",
 show="SCO SMTP Domain"

 - Change the local mail channel to reflect your domain. For example, enter:

 MCHN local, show="Local Delivery",
 que=local, tbl=local, ap=same,
 pgm=local, mod=imm, host="medusa.sco.COM"

- Verify that the SMTP mail channel entry is similar to the following example:

```
MCHN smtp, show="SCO SMTP Delivery",
que=smtp, tbl=smtpchn, ap=822,
pgm=smtp, mod=imm
```

- Add or change domains to reflect your domain. For example, enter:

MDMN "medusa.sco.COM",
show="Local domain", table=locdom
MDMN "sco.COM",
show="SCO SMTP Domain", table=smtpdom

3. To accommodate local cases where the fully qualified name is not given (for example: *user@medusa* as opposed to *user@medusa.sco.COM*) edit the file */usr/mmdf/table/local.dom* and alias the unqualified name. For example, enter:

medusa: medusa.sco.COM

4. Edit the file */usr/mmdf/table/local.chn* and add all the names of the local host:

medusa.sco.COM:medusa
medusa.UUCP:medusa
medusa:medusa

5. Edit the file */usr/mmdf/table/root.dom*. Make sure that your local machine name is entered correctly. For example, it should look like this:

```
medusa:medusa.sco.COM
```

6. Additionally, you might wish to "uncomment" some of the top level domains by removing the "#" character from the beginning of the line. For example, if you are attached to uunet you see:

```
com             uunet.UU.NET
edu             uunet.UU.NET
```

 If you do this, you need to make sure that uunet.UU.NET is defined in one of your channel files.

7. To accommodate remote cases where the fully qualified name is not given (for example: *user@uscopia* as opposed to *user@uscopia.sco.COM*), edit the file */usr/mmdf/table/smtp.dom* and alias the unqualified name. For example, enter:

```
#
ionesco: ionesco.sco.COM
uscopia: uscopia.sco.COM
```

8. Edit the file */usr/mmdf/table/smtp.chn* and add the names and IP addresses of all the remote hosts. For example, enter:

```
ionesco.sco.COM:        132.147.128.12
uscopia.sco.COM:        132.147.128.14
```

9. Change directories to */usr/mmdf/table*, then execute the command **./dbmbuild** to recompile your mail routing system.

10. Note that the utility **checkaddr** can be very useful. For example, enter:

```
checkaddr root@medusa
```

9.6 Adjusting sendmail Configuration

Read this section only if you have chosen to use **sendmail** instead of MMDF as your mail handler. SCO strongly recommends that you use MMDF as your mailer, and supplies **sendmail** primarily for compatibility with existing SCO TCP/IP LANs already using it.

To use the **sendmail** mail system, you must first run **mkdev sendmail-init**, which initializes **sendmail** and configures it by invoking **mkdev cf**. After first initializing **sendmail**, you can reconfigure it at any time by running **mkdev cf**.

The **mkdev cf** utility configures **sendmail** for most installations. Because of the complexities of writing custom **sendmail** configuration files, SCO does not support **sendmail** when used with configurations outside the capabilities of **mkdev cf**.

The **mkdev cf** script supports both uucp and Internet style addressing. The uucp configuration allows a network administrator to designate a machine on the network as the UUCP Gateway Machine, which will process all UUCP requests for the net or subnet.

1. Type **mkdev sendmail-init** at the command line. The message `Saving the following files:` appears, followed by a list of files and this message: `The mail system will now use sendmail for delivering messages.`

 The **mkdev sendmail-init** command installs and configures **sendmail**. The **mkdev cf** command reconfigures **sendmail**.

2. A list of files is displayed, along with the message: `Press ⟨Return⟩ to continue.`

3. A menu appears. You must go through the various options of the menu in sequence.

4. The first menu option is to edit UUCP connections. Default values can be taken from the system, but you need to know if your machine is a UUCP gateway or not.

5. The second menu option is to edit the domain name. The default domain name is taken from the **hostname** utility; otherwise, you can specify a domain name.

6. The third menu option is to edit alternate host names. This menu selection is optional.

7. The fourth menu option generates the new *sendmail.cf* file. A display of your selections is presented first, then you can generate the new file.

 You are prompted with this message: `Do you wish to change anything? [y/n]` The old *sendmail.cf* file is saved as */usr/lib/custom/save/sendmail.cf*.

8. The fifth menu option is to edit network configuration information. The default answers are all "no" for the questions displayed in this option. Change the answers if necessary. Note that you cannot answer "yes" to both questions 2 and 3. If your machine is a UUCP mail gateway, then answer "yes" to the question `Is there a UUCP gateway?`.

9. The sixth menu option is simply a display that allows you to review your answers from the preceding options. If necessary, go back and correct any errors at this point by returning to the earlier option. This menu selection is optional.

10. The seventh menu option lets you quit the **sendmail** configuration menu.

9.7 Testing TCP/IP Runtime

1. Reboot the system by entering the following command:

 /etc/shutdown

2. Verify the display of addresses. If the new drivers do not appear, then the hardware and software settings probably do not match.

3. The message `Starting TCP...` appears, followed by a copyright notice. (This notice only appears the first time TCP is started after a reboot.) The message `TCP startup complete...` then appears.

4. Test to see if TCP/IP itself is configured correctly without contacting the network. You can do this with the **ping** command. Type:

 ping localhost

 A display similar to the following should appear, and then be repeated about once per second. Press the interrupt key to end the display.

   ```
   64 bytes from 127.0.0.1:
   icmp_seq=0, time = 20. ms
   ```

 If **ping** fails, check your hardware connections and try again. If **ping** still fails, then TCP/IP is not installed correctly. Reinstall TCP/IP.

5. You can use the **netstat** command to display a list of all the drivers, including the slip drivers. Use the command:

 netstat -i

6. Verify the connectivity of each network host and driver by using **ping** and the IP address of each driver. Make sure that the hosts you are attempting to reach are active. You should verify that all physical connections are good.

9.8 Tuning TCP/IP Runtime

You might need to change the configuration of the system if the default configuration is not accurate for your requirements. SCO TCP/IP Runtime is built around the STREAMS mechanism, and so its behavior depends on the configuration of certain STREAMS parameters, particularly the buffer space allocated for use by STREAMS. The default configuration of buffer space is tuned for the following workload:

- two users using **ftp** to access another system
- two users from another system accessing the local system with **ftp**
- two users using **rlogin** to access another system
- two users accessing the local system via **rlogin**
- four to five sessions of **telnet** and **rlogin** (totaled together) at any one time

See Chapter 1 of the *TCP/IP Administrator's Reference* for more information, particularly the section "Network Tuning and Troubleshooting." Note that inadequate STREAMS buffer space can cause the following problems to occur: connections can get lost for no reason, processes that communicate over the network can hang, and programs that communicate over the network can suddenly malfunction. If this should happen, use the Link Kit **configure**(ADM) command to increase STREAMS resources.

10. Starting and Stopping SCO TCP/IP

Reboot the system by entering the following command:

/etc/shutdown

After rebooting with the new kernel, SCO TCP/IP software starts automatically when the system enters multiuser mode.

To halt the SCO TCP/IP software, type:

/etc/tcp stop

To restart SCO TCP/IP, bring the system to system maintenance mode and then back into multiuser mode.

11. Removing SCO TCP/IP Runtime

Because SCO TCP/IP is an integral part of your system and is linked with your operating system kernel, removal of the software is a delicate and important task. Before removing SCO TCP/IP, you should remove all other software, such as SCO NFS and ODT-DATA, that relies on SCO TCP/IP. It is crucial that you follow the instructions closely. Read through the instructions completely before you begin. Follow these steps to remove SCO TCP/IP Runtime from your UNIX system:

1. Log in to the system as *root* and bring the system to system maintenance mode. You see the following two messages: `TCP Shutdown` and, after a pause, `TCP Shutdown Complete.`

2. Enter **custom** at the prompt.

3. Select Remove.

4. Select SCO TCP/IP Runtime from the point-and-pick list.

5. Select Entire Product to remove all of SCO TCP/IP Runtime, or Packages to remove portions of the product. If you select Packages, you then select which packages to remove. TCPRT removes SCO TCP/IP Runtime, SNDMAIL removes the **sendmail** runtime, and MMDFTCP removes the SMTP channel from MMDF. ALL removes all SCO TCP/IP files, and has the same effect as removing the entire product.

 After a few messages asking you to verify the removal and telling you that the files and drivers are being removed, you return to the **custom** menu. Select **quit** and press ⟨Return⟩. Select **yes** and press ⟨Return⟩.

6. You see the prompt `Do you wish to relink the kernel? (y/n)`. Type **y**. This procedure takes several minutes. If you want the kernel to reboot by default, type **y** at the prompt. You are asked if you want the kernel environment rebuilt. Type **y**. A message tells you to reboot the system, which you can do after exiting the **custom** menu. Press any key to return to the **custom** menu.

7. You are returned to the **custom** menu. Select **quit** and press ⟨Return⟩. Select **yes** and press ⟨Return⟩ to exit.

8. Reboot the system with the **init 6** command.

12. Supporting Dialup SLIP Lines

SCO TCP/IP does not directly support dialup SLIP lines. However, it is possible to implement a workaround as the following example shows.

If machine A wishes to connect to machine B via a dialup SLIP connection, machine B must already have executed a **slattach** command. The following example for machine B can be executed at the super user's shell prompt or via the */etc/tcp* script. Refer to the **slattach** manual page for more information.

```
(stty 1200; echo "ATE0\r" > /dev/tty1a) < /dev/tty1a
slattach /dev/tty1a slipb slipa 1200
```

The first command puts the modem in non-echo mode. This is important if the SLIP connection is to be used correctly. Note that the device special file chosen must be a non-modem control one (that is, */dev/tty1a* instead of */dev/tty1A* for COM1). Be sure that the modem is attached to the appropriate port specified in the **slattach** command.

Machine A must dial machine B before performing a **slattach**. The following example for machine A can be entered at a root shell prompt or in a shell script:

```
(stty 1200; echo "ATE0\r" > /dev/tty1a) < /dev/tty1a
/usr/lib/uucp/dialHA12 /dev/tty1a 5551212 1200

if [ $? ]
then
slattach /dev/tty1a slipa slipb 1200
else
echo "Error dialing\n"
fi
```

The first command puts the modem in non-echo mode. This is important if the SLIP connection is to be used correctly. In the above script, */usr/lib/uucp/dialHA12* returns 0 (TRUE) if dialing is successful. Note that the dialer program (**dialHA12**) is part of the operating system's UUCP package. If it is not installed, you can use the **custom** utility to do so. Refer to your operating system documentation for more details.

Also note that each machine's **slattach** command must have matching, supported baud rates. It is important to remember that only the super user can attach or detach a network interface. The tty lines used for the SLIP connection must be dedicated only to this task.

Be sure to start */etc/routed* after and not before */etc/slattach*. If **routed** is started before **slattach**, the following message appears on the console at roughly one-minute intervals:

```
routed: packed from unknown router <net address>
```

13. Known Inconveniences with This Release

This section contains information on software and hardware limitations, unsupported features, and workarounds that you can encounter when you install and use SCO TCP/IP Runtime. The section is divided into two lists, one describing inconveniences that are general to TCP/IP and one describing inconveniences that are specific to running SCO TCP/IP Runtime over the UNIX operating system.

13.1 General Known Inconveniences

- If you remove an SCO LLI drivers update package from a system running SCO TCP/IP 1.1.3 or earlier, you must afterward remove the TCP/IP product, then reinstall it.

- The TCP/IP command **rcp** has a different functionality from that of the **rcp** supplied with the UNIX system. The UNIX **rcp** spools up requests for files to be copied across a Micnet network, while the TCP/IP **rcp** performs an immediate file copy across a TCP/IP Internet. Neither command knows about the other, and they do not cooperate in any way. Also, they support different sets of command line options. For this release, the UNIX **rcp** is in */usr/lib/custom/save/rcp*, while the TCP/IP **rcp** is installed in */usr/bin/rcp*. The user must do whatever is necessary to invoke the desired version of the command to access the appropriate network.

- The IBM PS/2 386SX MC does not correctly recognize the Western Digital WD8003E/A network card. This is a hardware problem which is unrelated to SCO TCP/IP software.

- No more than two SLIP lines into a given machine are supported.

- **sendmail** does not handle delivery through Micnet or multiple UUCP gateways.. It does support single UUCP gateways, local mail, and mail sent through TCP/IP.

- The operating system can hang during serial device initialization if a Western Digital card is present. If this occurs, you must change the base I/O address in the TCP software and on the Western Digital card. Addresses 240 and 380 have been tested successfully. To reconfigure the software, remove the Western Digital driver. Then reinstall the driver, following the instructions in the section "Western Digital WD8003E" earlier in these notes. Refer to the Western Digital documentation for details on selecting an alternate base I/O address.

- The **-S** option to **netstat** is not currently supported.

- If you installed a previous version of SCO TCP/IP, you must follow the instructions in the *Release and Installation Notes* of that version of the software to remove it before installing the latest version of SCO TCP/IP. You must also remove the */etc/perms/tcprt* file if it still exists after you remove TCP/IP.

- A large number of unreferenced files can appear on the */root* filesystem, even after a clean system shutdown. This is due to the behavior of the STREAMS cloning driver. This can usually be avoided by shutting down SCO TCP/IP before shutting down the system. The

system administrator should also periodically run **fsck**(ADMN) while in system maintenance mode to clean up the filesystem. This should usually be done about once a week, depending on whether the system is brought up and down frequently and whether network usage is heavy or light.

- Due to the interaction between STREAMS, VP/ix, and the kernel, network performance is impaired when running VP/ix.

- Using **rlogin** or **telnet** to log in to a machine running SCO UNIX System V/368 Release 3.2 can give the error message `bad login user id`.

 This message appears when someone else logs in as *root* and does a **tcp stop** followed by a **tcp start**. Because UNIX has C2-like security, the login id is automatically set when someone logs in as *root*. This login id is passed to *inetd* which passes it to *rlogind* or *telnetd*. *rlogind* or *telnetd* use */bin/login* which inherits the previously set login id (which was *root*). Then the login procedure calls **setluid()** which fails because the login id is already set.

 To avoid this error, start SCO TCP/IP using the **init(M)** procedure while logged in as *root* on */dev/tty01* rather than using **tcp start**. The procedure using **init** is as follows:

`init 1`	(puts you in system maintenance mode)
`init 2`	(starts the system in multi-user mode and starts SCO TCP/IP automatically)

 Proceed with normal start up.

13.2 Known Inconveniences over the UNIX System

The following is a list of known problems with this release of SCO TCP/IP Runtime for the UNIX operating system.

- The official, and fully supported, mailer is MMDF; consequently, we highly recommend that you use this mailer with SCO TCP/IP.

 For more information, see the section on adjusting sendmail configuration earlier in these notes.

- Host based mail routing of the following form is not currently supported:

  ```
  @relay.foo.DOM:user@machine.DOM
  ```

- The **netstat** command might not always work properly under load. Some commands (such as **netstat -a** or **netstat**) can give the error message `corrupt control block chain`

- The SCO TCP/IP installation can reduce configured STREAMS kernel parameters. If you have already configured STREAMS data, you might need to reconfigure them after installing SCO TCP/IP.

- The init screen for the 3Com 3C501 and 3C503 cards display an incorrect default interrupt vector. The default manufacturer's interrupt vector setting for these cards is interrupt vector 3.

- The boot screen for the 3C501 and 3C503 drivers shows an incorrect ending address for the e3A and e3B drivers. These drivers actually uses only 16 ports. For example, an e3A driver configured for I/O base address 0x300 should use up to and including I/O address 0x30f. The driver does not use I/O address 0x310. Note that this is

an error in boot screen reporting and not in the actual I/O addresses used.

- The **mkdev** utility often concludes with a screen message similar to the following:

```
Reboot via /etc/reboot
```

This message should instead direct you to reboot using **shutdown** or **init 6**. Using **reboot** on the UNIX system can result in data loss when processes are interrupted.

- Both **rcp**(TC) and **rcmd**(TC) can generate error messages if the destination user is running the C shell (**csh**(C)).

- If there are errors present after you have relinked your kernel, you can get the following system messages:

```
To complete installation run mkdev tcp
and reboot the system via init 6
```

Ignore these messages and reconfigure the primary cause of the error (such as an interrupt vector or memory address conflict). Then reboot the system.

- The command **sendmail -bi** should read the file */usr/lib/mail/aliases* and create two database files, called */usr/lib/mail/aliases.pag* and */usr/lib/mail/aliases.dir*. Currently, this option to **sendmail** is not operational.

- Executing the **tcp stop** command and then immediately executing the **tcp start** command fails. To restart, you must bring your system to single user (system maintenance) mode and reboot the system.

- If you execute the **tcp stop** command, you disable both the **rlogin** and **telnet** commands. You must reboot the system to use these commands again.

- If you use application programs over the network, using the direction keys to move the cursor can add unwanted text or commands to the application. This is due to the packet nature of the network transmissions. Direction keys generally send a multiple character sequence to effect cursor motion. If this sequence is broken across packet lines, your application might not interpret the character sequences correctly.

- When you use **tftp**, the file that is the target of the transfer must already exist and be publicly writable, or you get the error message: `Error code 1: file not found`. This is a feature of **tftp**.

- With **ftp**, when you toggle the **sendport** command and then do an **mput** command, you get this error message roughly every other data transfer: `425 Can't build data connection: Connection refused.`

- While interrupt 02 is valid on all machines with SCO TCP/IP, interrupts on IRQ2 are sometimes lost because of inconsistencies in some industry standard computers. This is a hardware problem, not a problem with SCO TCP/IP. If you have certified that your system is correctly installed, but you are losing interrupts on IRQ2, it is due to a hardware defect.

- When the system is in the two-user activation state, the **telnet** and **rlogin** utilities report the error: `Attempt to exceed system login limit` and deny access if more than one console multiscreen is enabled.

- There is gradual attrition of streams and queues. Apparently they are not always reclaimed when sockets are closed. The problem has no reproducible test.

- **rcp** occasionally copies a file but does not exit. This problem has not been reproduced.

- Parsing of */etc/sockcf* causes the default protocol within a type to be the last specification instead of the first. This is caused when the kernel constructs the protocol table by adding new entries to the beginning instead of the end.

 A workaround to this problem is to reverse the order of the entries in */etc/sockcf* for protocols of the affected type(s). The problem can be fixed by changing the kernel to add new entries to the end of the table instead of the beginning.

- The **rlogin** and **telnet** utilities sometimes misread the *.profile* file during the login procedure. This results in the terminal type being set incorrectly to "unknown." When this happens, you must set the **TERM** environment variable by hand. For example, type:

 TERM=ansi; export TERM

14. Documentation Errata

The following section defines known errata in the printed documentation set.

ftp(TC)

In Chapter 5 of the *SCO TCP/IP User's Guide*, the list of available **ftp** commands omits the **account** command. This command is described in the **ftp**(TC) manual page.

Remote File System (RFS)

The online man pages for Remote File System (RFS), rfs(ADMN and rfsaddr(ADMN) should be ignored. SCO does not support RFS and has no plans to do so. Also ignore references to RFS in the following man pages: inetd(ADMN), inet(ADMP), and SCO UNIX man pages pladmin(ADM), sar(ADM), and messages(ADM).

SCO® UNIX® System V/386

Operating System

Additional Manual Pages

NOTE

Insert these pages into the (ADM) section of the *System Administrator's Reference*.

The Santa Cruz Operation, Inc.

WDNSETUP

Configuration program for WD LAN adapter boards

Syntax

```
wdnsetup
wdnsetup -io:xxx [node:xxxxxxxxxxxx]
wdnsetup -node:xxxxxxxxxxxx

wdnsetup -inter -io:xxx [node:xxxxxxxxxxxx]
wdnsetup -inter -node:xxxxxxxxxxx
wdnsetup -io:xxx [node:xxxxxxxxxxxx] [..] ...
wdnsetup -node:xxxxxxxxxxx [..] ...
```

Description

The Setup Program for UNIX System V/386 is intended to configure boards that use the WD83C583, as listed below:

- EtherCard PLUS with ROM socket (WD8003EB)
- EtherCard Express (WD8023E)

The Setup program can be run only by the 'superuser' due to dangerous conditions that might occur (See WARNING at the end of this document).

This program can support up to four boards on the same bus, assuming that each board uses a 583, and has a unique base I/O address. Upon power on, the contents of EEROM are loaded into the internal registers on the 583. These registers occupy the first 16 I/O addresses starting at the base I/O of a specific board.

The Setup program allows you to display or change the current configuration. The configuration can be changed by specifying the options on the command line, or through the interactive mode. You can choose the board you want to query or configure by specifying the base I/O address of the board, or the node address of the board.

Examples

To display configurations, enter the following:

wdnsetup

The program tries to find all 583-based boards (up to four) on the machine with the range of I/O address 200 - 3E0 (hex), and display each board's configurations.

To display the configuration of a specific board, enter the following:

wdnsetup -io:*xxx* **[-node:***xxxxxxxxxxxx***]**

or

wdnsetup -node:*xxxxxxxxxxxx*

The program finds the board with specified base I/O address or node address, and displays its configuration.

To change the configuration of boards in the command mode, type

wdnsetup -io:*xxx* **[-node:***xxxxxxxxxxxx***]** [..] ...

or

wdnsetup -node:*xxxxxxxxxxxx* [..] ...

The program takes the options specified, prints out the configuration to be saved and, if confirmed, changes the current configured value.

To change the configuration of a board in the interactive mode, enter the following:

wdnsetup -inter -io:*xxx* **[node:***xxxxxxxxxxxx***]**

or

wdnsetup -inter -node:*xxxxxxxxxxxx*

The program finds the specified board, and goes through each option. The current configured option is shown. If no change is to be made, pressing ENTER will leave the option as is.

A list of options with their possible values follows:

-newio:xxx	specifies the new base I/O address. Range : 200 - 3E0 The address xxx will be a hex value, and must be a multiple of 20 hex.
-irq:n	specifies the interrupt level (IRQ) that the LAN adapter board will use to notify the PC. The possible values of n are 2, 3, 4, and 7 for the old boards. For the new boards : 2, 3, 5, and 7.
-ena_irq:x	specifies whether the interrupt is enabled or disabled. Possible values for x are 'y' and 'n' (y=yes n=no).
-ram:xxxxx	specifies the base physical address of the on-board memory that is shared with the PC. The address will be a hex address in the range of C0000 - DE000, and must be on a boundary of the RAM size (e.g. must be a multiple of 8K for an 8K RAM).
-ramsize:xx	specifies the size of the RAM window in Kbytes. Acceptable values for xx are 8 or 32. Note: 32 Kbytes is only available on certain custom boards.
-6mhz_at:x	specifies the type of machine the adapter is installed, either a 6 MHz AT or not. Possible values of x are 'y' and 'n' (y=yes n=no).
-rom:xxxxx	specifies the base address of the boot ROM. The address will be a hex address in the range of C0000 - DE000, and must be on a boundary of the ROM size.
-romsize:xx	specifies the size of the ROM in Kbytes. Acceptable values for xx are 16, 32 or 64.

-factory — forces the adapter to the factory configuration (overrides other command line options, including - auto). Factory defaults are:

Base I/O:	240 (hex)
IRQ:	3 Disabled
RAM:	8K at D0000 (hex)
ROM:	Disabled
6 Mhz AT:	No

-auto — automatically select a new configuration (overrides other command line options, but overridden by - factory option). Auto configuration values are:

Base I/O:	280 (hex)
IRQ:	3 Enabled
RAM:	8K at D0000 (hex)
6 Mhz AT:	No

-v — displays the program name, version, and copyright information only.

-h — displays HELP information (the list of valid command line parameters) only.

Warnings

Run this program in a single user mode only for the following reasons:

- Since it is possible that the adapter card uses the same address as another device does, it might cause unpredictable results if some other user tries to use the device.
- The program uses direct I/O mode to the device and may behave incorrectly if a WD LAN adapter is not at the specified address.

Operating Systems supported:

- Any standard UNIX System V/386, Release 3.2
- Interactive Systems' 386/ix version 1.0.5 and later
- SCO XENIXversion 2.3.1 and later